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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/420,086	10/18/1999	WARREN M. FARNWORTH	98-0105.01	2322

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EXAMINER
PAREKH, NITIN

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 07/17/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/420,086	Applicant(s) Farnworth et al
	Examiner Nitin Parekh	Art Unit 2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *May 9, 2002* .

2a) ☒ This action is **FINAL.** 2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *25-39 and 47-53* is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *25-39 and 47-53* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). *5 and 6*
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 25-39 and 47-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hembree (prior art-IDS, US Pat. 5783461) in view of Frankeny et al (US Pat. 5065227), Pedder (US Pat. 5717245) and Gilmour et al (US Pat. 5391917).

Regarding claims 25, 52 and 53, Hembree discloses a semiconductor component/package comprising:

- a composite substrate/interconnect (14/16 in Fig. 2) comprising a first surface with a conductive layer/trace (40, 56, 58, etc. in Fig. 2 and 4) and an opposing/second surface (31 in Fig. 2)

- a plurality of conductors on the conducting layer (68 in Fig. 2-5) on the first surface (Fig. 4 and 5; Col. 6, line 21), each conductor comprising a plurality of first grooves/raised contact members (40/68/70, etc. in Fig. 2-5A) through the conductive layer and configured for electrical connection with the semiconductor die

- a semiconductor die on the first surface in electrical communication with the conductors (die 12 in Fig. 2)
- a plurality of conductive lines/vias/second grooves through the substrate/interconnect (49 in Fig. 3A) from the first surface to the second surface and in electrical communication with the conductors (40 in Fig. 2), and
- a plurality of external contacts/balls on the second surface in electrical communication with the conductive vias (38 in Fig. 2; Col. 4, line 53)
(Fig. 2-5A; Col. 3, line 45- Col. 6, line 65).

Hembree fails to specify using a plurality of conductors defined by a plurality of laser machined grooves or vias through the conductive layer, the conductors and the grooves having a width as small as 5 microns and comprising portions of the conductive layer electrically isolated from one another by the grooves and separated by remaining portions of the conductive layer.

Pedder teaches using conductive stubs/grooves/vias formed/trimmed by conventional laser trimming (Col. 2, line 25, Col. 8, line 38; Fig.2, and 9) on the conductive layer/trace of the substrate in a multichip module/ball grid package. Pedder further teaches forming conductive pattern comprising stubs/grooves (94 , 95, etc. in Fig. 9) using laser trimming/machining (Col. 8, line 45-54) which include conventional metallization/trace in first/X and second/Y directions. Pedder teaches using

conductor/trace wiring design where the conventional wiring layout parameters such as spacing, pitch, number of conductors, vias, etc. are selected to achieve the desired electrical performance related to electrical signal, power/ground, impedance and frequency requirements (Col. 5, line 11-Col. 6, line 50) for the multichip module/package. Pedder teaches having the metallization/conductor pads on the upper metallization layer having a pitch/spacing of 400 microns (Col. 5, line 15).

Gilmour et al teach forming a plurality of conductors/pads, lines and laser machined vias having a spacing of 40 microns (3/5 in Fig. 3; Col. 4, line 20-60) on a first surface of a substrate.

Frankeny et al teach using conventional laser drilling/etching or punching of metal (Fig. 5; Col. 5, line 63- Col. 5, line 9) to expose the metal to define a plurality of vias (98 in Fig. 5) through the conductive layer (copper layer in Fig. 5). Frankeny et al further teach forming the conductors comprising portions of the conductive layer electrically isolated from one another by the grooves and separated by remaining portions of the conductive layer where the conducting layer is patterned using conventional plating and etching methods. It would be obvious to one of ordinary skill in the art to use any of typical etching methods such as laser machining, plasma etch etc. to form conductor pattern in first/X and second/Y directions to achieve the desired first and second width/spacing dimensions as small as 40 microns or less than 40 microns.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate a plurality of conductors defined by a plurality of laser machined first or second grooves through the conductive layer, the conductors comprising portions of the conductive layer electrically isolated from one another by the grooves and separated by remaining portions of the conductive layer, the grooves having a width as small as 5 microns so that the resonance characteristics and electrical performance of the contacts/device can be improved using Pedder, Gilmour et al and Frankeny et al's conductor structure in Hembree's component.

Regarding claims 26 and 27, Hembree discloses a semiconductor die flip chip bonded/mounted or wire bonded to the a plurality of bond pads on the conductors/substrate (56/60 in Fig. 4; Col. 6, line 21).

Furthermore, Pedder teaches using a multichip module/ball grid package where the a semiconductor chip or multichip can be mounted on the conductors using conventional wire bond or flip chip connections (Fig. 2; Col. 2, line 36; Col. 4, line 28; Col. 4, line 50).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate a plurality of dice flip chip mounted or wire bonded to the conductors so that the chip density and multichip connection capability

can be improved using Pedder, Gilmour et al and Frankeny et al's module design in Hembree's component.

Regarding claim 28, Hembree discloses the substrate comprising a material selected from the group consisting of plastic, glass filled resin, silicon and ceramic (Col. 2, line 17-33; Col. 6, line 35) but fails to specify using metal, germanium or gallium arsenide.

It is conventional in the chip packaging art to use semiconductor, insulative and metal substrates including silicon, ceramic, germanium or gallium arsenide, etc.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the substrate comprising a material selected from the group consisting of plastic, glass filled resin, silicon, ceramic, metal, germanium and gallium arsenide so that the desired electrical and thermal performance can be achieved using Pedder, Gilmour et al and Frankeny et al's module design in Hembree's component.

Regarding claim 29, Hembree discloses the conductors comprising a plurality of contacts adapted for an external electrical connection to outside circuitry in a form of a ball/grid array (Fig. 2-3A; Col. 4, line 48).

Regarding claims 30-32, 47 and 49-51, Hembree discloses a semiconductor component/package comprising:

- a composite substrate/interconnect (14/16 in Fig. 2) comprising a surface with a conductive layer/traces (40, 56 and 58 in Fig. 2 and 4) having a thickness
- a plurality of conductors and pads having width and thickness (40, 56, 58 and 60 in Fig. 2, 4 and 5) on the first surface (Fig. 4 and 5; Col. 6, line 21), each conductor and pad comprising grooves/raised contact members (40, 58, 60, 66, 68, etc. in Fig. 2, 4 and 5) through the conductive layer extending in a first and second directions (Fig. 2-5A; Col. 3, line 45- Col. 6, line 65), the conductor including a plurality of first pads/contacts (60 in Fig. 4-5A) on first ends
- a semiconductor die mounted/flip chip bonded on the substrate, the die comprising a plurality of second pads bonded (62 in Fig. 5A) to the first pads (Col. 6, line 25)
- a plurality of conductive lines/vias in the substrate/interconnect (49 in Fig. 3A) in electrical communication with the conductors (40 in Fig. 2), and
- a plurality of second/external contacts on the second surface in electrical communication with the conductive vias (38 in Fig. 2; Col. 4, line 53) and adapted for an external electrical connection to outside circuitry

(Fig. 2-5A; Col. 3, line 45- Col. 6, line 65).

Hembree fails to specify using a plurality of pairs of laser machined grooves through the conductive layer, the conductors comprising portions of the conductive layer electrically isolated on either side by a pair of laser machined grooves.

As explained above for claim 25, Frankeny et al, Gilmour et al and Pedder teach forming the conductors comprising portions of the conductive layer electrically isolated from one another by the grooves/openings and separated by remaining portions of the conductive layer using conventional laser drilling or punching of metal.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate a plurality of pairs of laser machined grooves through the conductive layer, the conductors comprising portions of the conductive layer electrically isolated on either side by a pair of laser machined grooves so that the electrical performance of the contacts/device can be improved using Pedder, Gilmour et al and Frankeny et al's laser drilled conductors in Hembree's semiconductor component.

Regarding claims 33 and 48, as explained above for claims 26 and 27, Hembree further discloses a package/chip module/multichip module comprising a semiconductor die flip chip bonded/mounted or wire bonded to the a plurality of bond pads on the conductors/substrate (56/60 in Fig. 4; Col. 6, line 21; Fig. 1-9).

Regarding claim 34, Hembree fails to specify using an encapsulant at least partially covering the die and a portion of the surface.

Peddler teaches using the conventional sealant/encapsulant to encapsulate the BGA package/module in the chip packaging art (Col. 1, line 55).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time invention was made to use an encapsulant covering the die and a portion of the surface so that added protection can be provided using Pedder, Gilmour et al and Frankeny et al's design in Hembree's semiconductor component.

Regarding claims 35-39, the claim elements have been addressed in the rejections as explained above for claims 25-34.

Response to Arguments

3. Applicant's arguments with respect to claims 25-39 and 47-53 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP §

706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Papers related to this application may be submitted directly to Art Unit 2811 by facsimile transmission. Papers should be faxed to Art Unit via Technology Center 2800 fax center located in Crystal Plaza 4, room 4C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number in (703) 305-3410. The examiner can be normally reached on Monday-Friday from 08:30 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas, can be reached on (703) 308-2772. The fax number for the organization where this application or proceeding is assigned is (703) 308-7722 or 7724.

Nitin Parekh

07-10-02

Steven Loke
Primary Examiner
Steven Loke